

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY REGION 8



**Subject:** POLREP #1 (Initial Pollution Report) – Removal Assessment  
Gold King Mine Site  
Site #085M  
Silverton, CO  
Latitude: 37.8945 Longitude: -107.6384

**To:** (b) (6), Response Unit Chief  
(b) (6), Program Director

**From:** (b) (6), On-Scene Coordinator

**Date:** September 25, 2014

**Reporting Period:** August to September 2014

**1 INTRODUCTION**

**1.1 Background**

<b>Site Number:</b>	085M	<b>Contract Number:</b>	
<b>D.O. Number:</b>		<b>Action Memo Date:</b>	
<b>Response Authority:</b>	CERCLA	<b>Response Type:</b>	Time-Critical
<b>Response Lead:</b>	EPA	<b>Incident Category:</b>	Removal Assessment
<b>NPL Status:</b>	Non-NPL	<b>Operable Unit:</b>	OU 3
<b>Mobilization Date:</b>		<b>Start Date:</b>	9//2013
<b>Demob Date:</b>		<b>Completion Date:</b>	
<b>CERCLIS ID:</b>		<b>RCRIS ID:</b>	
<b>ERNS No.:</b>		<b>State Notification:</b>	
<b>FPN#:</b>		<b>Reimbursable Account #:</b>	

**1.1.1 Incident Category**

CERCLA Removal Assessment

**1.1.2 Site Description**

The Gold King Mine is located within the Cement Creek watershed, a component of the upper Animas River watershed in San Juan County, Colorado. These watersheds within the volcanic terrain of the San Juan Mountains were the focus of both large and small scale mining operations that flourished beginning in 1871 and lasted until as late as 1991. Several other mines in the Cement Creek basin also have draining adits. The flow from the Red and Bonita Mine, the Gold King (Level 7) Mine, and the Mogul Mine all experienced significant increases in flow following the

plugging of the American Tunnel that occurred between 1998 and 2002. Water quality in the Animas River has been degraded progressively since that time.

The Animas River and many of its tributaries, including Cement Creek, carry high concentrations of metals from both acid rock/mine drainage at mine sites and from natural sources not impacted by mining. Water quality studies have indicated that the Gold King Mine is one of the major sources of metals to the Animas River near Silverton. The EPA, BLM and USGS have undertaken activities to more fully quantify the various mine site sources and to quantify diffuse metals sources within the mine district that contribute to the metals loads in the Animas River. These actions are intended to contribute to the information needed to identify potential remedies to reduce or prevent the on-going hazardous substance (metals) releases from the mine sites. The Animas River Stakeholder Group (ARSG) was also involved in the overall audit investigation objectives and review of information associated with investigations.

The Gold King 7<sup>th</sup> Level is located above a steep south-facing waste dump that borders on North Fork Cement Creek. The portal is currently buried. Two culverts drain water from the mine and the adit discharge is channeled into a cement culvert, through a flume, into a PVC channel, down the east face of the waste rock pile, and into the North Fork of Cement Creek. North Fork Cement Creek joins with the main stem of Cement Creek downstream of the Red and Bonita Mine. A second location west of the main adit discharges intermittently onto the site road. The mine is accessible during non-snow months of the year, typically late June through early October. The site is seasonally inaccessible due to snow and extreme weather conditions. The mine is on steep terrain that creates limiting conditions for operations.

#### **1.1.2.1 Location**

The Gold King Mine Site is located in San Juan County, Colorado. The portal is approximately 9 miles north of the town of Silverton, Colorado, at 11,386 feet above mean sea level (AMSL). Road access is via County Road (CR) 110 from the town of Silverton to CR53 at the abandoned town site of Gladstone. CR53 continues northward up the Cement Creek valley to CR51, which continues up to the mine site, approximately 0.75 mile northeast of Gladstone.

#### **1.1.2.2 Description of Threat**

Since 2009, discharge rates from the Gold King 7<sup>th</sup> Level adit have been observed to range from 112 to 252 gpm. The discharge water pH ranged from 2.3 to 5.1 standard units. Discharge from the Gold King 7 Level adit contains high concentrations of cadmium (36.1 micrograms per liter (µg/L) to 138 µg/L), copper (2450 µg/L to 12100 µg/L), aluminum (7200 µg/L to 60000 µg/L), iron (46,700 µg/L to 257,000 µg/L), manganese (23,500 µg/L to 34,200 µg/L), and zinc (13,000 µg/L to 41,900 µg/L) (concentrations measured from 2009 through 2014). The discharge from the adit represents a significant release of the heavy metals to the Animas River.

The results of a Screening Level Ecological Risk Assessment (February 2013) strongly suggested that the fish community in the Animas River at and below Silverton would experience high stress under current conditions. For example, the surface water hazard quotient for zinc in the Animas River below the confluence with Cement Creek is approximately 4, which is four times the expected no-effects level. In addition, the study identified aluminum, copper, lead, and zinc as the major risk drivers to insectivorous birds ingesting surface water, sediment, and aquatic invertebrates from the Animas River at and below Silverton. Metal concentrations measured in the substrate of the Animas River at and below Silverton were expected to be highly toxic to benthic invertebrates. Recent fish population studies conducted by the Colorado Division of Wildlife found no fish in the Animas River below Cement Creek for approximately 2 miles.

### 1.1.3 Preliminary Removal Assessment/Removal Site Inspection Results

The Gold King Mine began draining acid mine drainage a few year following the bulkhead construction in the American Tunnel of the Sunnyside Gold Mine. Flows from the mine have fluctuated significantly over the period monitoring by EPA. The Gold King Mine adit is collapsed which prevented accessing the workings to evaluate the source of water discharging from the mine. Investigation of the disturbed slope and hillside above the adit showed no sign of water seepage. Three portal areas are associated with the Gold King Mine: the Level 7, Number 1, and Samson portals. In the 1980s a bypass adit (new portal) was driven at Level 7 to bypass a collapse in the original tunnel. All four portals were dry until after the American Tunnel was bulkheaded in 1995.

In 2007 the mine drainage from the Level 7 portal breached the existing ditch and saturated the top of the Level 7 waste rock pile, leading to a slope failure. In 2008, the State of Colorado Division of Reclamation, Mining, and Safety (DRMS) moved the ditch, directing water toward the east face of the waste rock pile, and lined it with half round high density polyethylene (HDPE) pipe. In 2009 both the old and new Level 7 portals, which had been partially collapsed, were backfilled by DRMS. An observation pipe and a drainage pipe were installed in the old portal, but during closure the timbers in the portal collapsed, burying the pipes. The drainage pipe continued to drain at roughly 200 gallons per minute (gpm), the same flow rate as was observed prior to the collapse. Also in 2009, a concrete ditch was installed to receive discharge from the old portal and a 3-inch Parshall flume was installed between the concrete ditch and half round HDPE pipe.

Discharge from the old portal flows from the discharge pipe into the cement culvert, through the flume, into the half round HDPE pipe, down the east face of the waste rock pile, and into the North Fork of Cement Creek. Intermittent discharges from the new portal flow through a small channel and over the site access road. North Fork Cement Creek joins with the main stem of Cement Creek downstream of the Red and Bonita Mine.

In an effort to characterize the hazardous substance releases in the watershed, the surface water and mine adit discharges were sampled by EPA several times during the year over several years. It is now sampled two times each year (spring and fall) at established locations for water quality parameters, flow volume, and total and dissolved metals in Cement Creek and the Animas River by the EPA Environmental Services Assistance Team (ESAT). ESAT also performs laboratory analysis and data reporting to the SCRIBE network. (Additional flow data is present below in the Operations Section.)

**Mine Adit Discharge 2005 to 2011**

Mine	Elevation (feet AMSL)	Bulkhead Install	Flow Rate (gpm)				
			July 2005	September 2005	October 2006	Average 2010	Average 2011
Gold King	11,386	None	42	135	314	206	140

gpm – Gallons per minute. AMSL – Above mean sea level.

## 2 CURRENT ACTIVITIES

### 2.1 Operations Section

#### 2.1.1 Narrative

Water flowing from the Gold King 7<sup>th</sup> Level adit has very low pH and elevated metals concentrations. The mine is currently inaccessible due to a blockage at the portal. Initial work is needed to expose the adit behind the blockage, build a portal structure, and ensure water flows into the existing channel. Subsequent work will include entering and investigating the adit to identify actions that may be performed to reduce the volume or improve the quality of water released from the mine and thus reduce contaminant loading to North Fork Cement Creek and downstream waters. This activity is also in support of the anticipated bulkhead construction in the Red and Bonita mine. It was determined appropriate to attempt to open the Gold King mine prior to closing a bulkhead and changing the water elevations.

### 2.1.2 Response Actions to Date

- A retention pond was constructed in August and September 2014 at the base of the southeast corner of the waste dump to capture solids that might be released during the portal excavation, rehabilitation, and initial mine entries. The underlying ground is very porous so the pond was lined with geo-fabric to prevent release of solids through the subsurface to North Fork Cement Creek. A system was set up along the water channel outside the Gold King 7<sup>th</sup> Level adit to allow addition of sodium hydroxide and flocculant to the adit discharge to enhance solids settling in the pond. (This was the same approach used at the Red and Bonita mine for controlling the suspended solids, iron precipitates disturbed while removing the blockage.)
- On September 11, 2014 work began to reopen the mine tunnel from the existing adit. After only two hours of excavation by the sub-contractor (b)(4) the work on blockage was stopped when it was determined the elevation of the adit floor was estimated to be 6 feet below the waste-dump surface elevation. Work was temporarily suspended and the site was inspected by EPA (b)(6) and personnel from Colorado Division of Reclamation and Mining Safety (DRMS), ERRS, HW and START. It was determined that adit drainage would need to be managed in a larger settling pond(s) requiring additional treatment. No additional work could continue on the portal excavation.
- The condition that was exposed revealed that two 24 inch pipe were in the tunnel blockage adjacent to the top (roof) of the adit. Timbers were observed on the sides and a cap timber was also observed by the contractor. The presence of the 2 – 24 inch pipe indicated the current flow of water was coming out only four feet below the roof, and then there was approximately 6 feet of impounded water below the level of the dump surface. (See Photo below)
- The following day, the drain pipe (2 - 12 inch) were placed at the base of the blockage to capture the on-going mine drainage and direct flow into the existing concrete flume channel previously installed at the Gold King 7<sup>th</sup> Level Mine collapsed portal. In order to do route the water into the channel, a section was removed from the concrete channel north wall (approximately 26" by 10") to allow for construction. The two 12" diameter PVC (polyvinyl chloride) pipes were installed to better direct adit drainage water from the portal into the concrete channel. Geo-fabric, crushed rock, and quick-dry concrete was used to secure the pipes in place. The portal area was backfilled and compacted with additional loads of crushed rock to maintain a stable surface at the portal for potential future work.
- Portal excavation was only completed for approximately 20 feet in from the adit gate. Collapsed rock continues to seal the mine portal, with adit piping partially visible. Due to seasonal weather limitations at high altitude, no further work at the Gold King Mine was scheduled for the rest of this year.
- During the week of August 25, 2014, flow from the Gold King Mine through the flume was approximately 112 gpm. On September 11, prior to any Site work, the flow was less than 12.6 gpm and the intermittent discharge west of the primary discharge point was less than 5 gpm. The reason for reduced discharge is unknown but may be related to seasonal inflows to the mine.

## 2.2 Planning Section

### **2.2.1 Anticipated Activities**

In 2015, additional work to reopen the portal will be performed. The water management system to be operated during the mine entry will be evaluated during the winter. Installation of the temporary system will occur prior to entry anticipated for July 2015. Based on previous activities, it is estimated that the work may require four weeks to be completed, including the set up time for the water management system.

### **2.2.2 Issues**

Adit drainage will need to be closely monitored during any future excavation work. Drainage will need to continue to be directed into the channel or alternate conveyance so it can be transported to the water treatment area on site. Future excavation of the portal may require shoring or removing additional slope face material to prevent rock collapse. The limited access to area and limited space for equipment on site presents additional challenges to the operation.

## **2.3 Logistics Section**

No information available at this time.

## **2.4 Finance Section**

No information available at this time.

## **2.5 Other Command Staff**

### **2.5.1 Community Involvement**

The Animas River Stakeholders Group is actively involved with the work in the watershed and is routinely briefed on the work at the Red and Bonita Mine. It was agreed among the ARSG that attempting to investigate the Gold King Mine is appropriate next step in conjunction with the Red and Bonita mine work. The group was formed to improve water quality and habitats in the Animas River through a collaborative process designed to encourage participation from all interested parties. Participants include mining companies, citizens, environmental organizations, land owners, local governmental entities, and state and federal regulatory and land management agencies. Regular meetings are held with the participants.

## **3 Participating Entities**

State of Colorado Division of Reclamation, Mining, and Safety (DRMS), Animas River Stakeholder Group (ARSG), Bureau of Land Management.

## **4 Resources On Site**

The following is a partial list of organizations that participated in performing work at the site for these activities:

- Environmental Protection Agency:
- DRMS
- Bureau of Land Management
- EPA Superfund Technical Assessment and Response Team (START)
- EPA Emergency and Rapid Response Services (ERRS) Contractor
- EPA Environmental Services Assistance Team (ESAT)

## **5 Additional Sources of Information**

Animas River Stakeholder Group website: <http://www.animasriverstakeholdersgroup.org/>

EPA OSC website: [http://www.epaosc.org/site/region\\_list.aspx?region=8](http://www.epaosc.org/site/region_list.aspx?region=8)



Gold King Mine – 9/11/14: collapsed adit pipe near roof of the adit/tunnel.